DOCUMENT RESUME

ED 415 230 SP 037 746

AUTHOR Ingersoll, Richard M.
TITLE Teacher Quality and Inequality.
PUB DATE 1996-00-00
NOTE 10p.; Paper presented at the Annual Meeting of the American Statistical Association (Chicago, IL, 1996).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Equal Education; Low Income Groups; Personnel Selection; Poverty; Public Schools; *Secondary Education; Secondary School Students; *Secondary School Teachers; Teacher Competencies; *Teacher Effectiveness; *Teacher Qualifications; Teacher Supply and Demand; *Teaching Skills
IDENTIFIERS *Out of Field Teacher Assignment

ABSTRACT

This paper presents national data on the extent to which public secondary students are taught core academics by teachers without basic qualifications in their assigned teaching fields, examining whether there are inequalities in the distribution of adequately qualified teachers across and within different U.S. schools. Data came from the 1990-1991 Schools and Staffing Survey, a nationally representative study conducted by the National Center for Education Statistics. The sample included 25,427 public school teachers. Researchers examined data on subject taught, grade level, class type or track, student achievement level, student race/ethnicity, and number of students enrolled. They also looked at teacher certification status and major and minor fields of study. Results indicated that substantial numbers of students, regardless of type of school, were taught core academic subjects by teachers without at least a college minor in the field. There were distinct inequities in the distribution of out-of-field teaching across schools and classrooms. School poverty levels related to amount of out-of-field teaching. High-poverty schools had more out-of-field teaching than low-poverty schools. The amount of out-of-field teaching was not equally distributed across different types of classes and groups in schools. Students in high-track classes had less out-of-field teaching than did those in low-track classes. (Contains 2 tables and 18 references.) (SM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 415 230

TEACHER QUALITY AND INEQUALITY[1]

BY

RICHARD M. INGERSOLL
DEPARTMENT OF SOCIOLOGY
UNIVERSITY OF GEORGIA

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

R. M. Ingersoll

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

1. This paper was presented at the 1996 Annual Meeting of the American Statistical Association held in Chicago and appeared in the 1996 *Proceedings of the American Statistical Association.* It is drawn from a larger ongoing research project on teacher supply, demand and qualifications funded by the National Center for Education Statistics of the U.S. Department of Education (contract number RN93140001). This paper does not constitute an official NCES publication. The views expressed are solely those of the author.

SP037446

BEST COPY AVAILABLE

ABSTRACT

This paper presents national data on the extent to which students in the nation's public secondary schools are taught by teachers without basic qualifications in their assigned teaching fields. It seeks to address the question of whether there are inequalities in the distribution of adequately qualified teachers across and within different schools in the U.S. The data are from the 1990-91 Schools and Staffing Survey, a nationally representative survey conducted by the National Center for Education Statistics. The premise underlying this analysis is that adequately qualified staffing requires teachers at the secondary school level to hold, as a minimum prerequisite, at least a college minor in the fields they teach. Knowledge of subject matter does not, of course, guarantee qualified teachers, nor quality teaching. The premise is that basic subject knowledge is a necessary prerequisite for both.

This analysis focuses on the extent to which secondary-level students in the core academic subjects (mathematics, English, social studies, science) are taught by teachers without at least a minor in the field, that is, what proportion of students receive out-of-field teaching. The paper provides data on three questions:

1. What proportion of the nation's public secondary students are taught core academic subjects by out-of-field teachers?

2. Are students in public secondary schools serving predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in public secondary schools serving predominantly not poor or white students?

3. Are students in low-track, or lower-grade level classes, or classes predominantly comprised of minority students, more likely to be taught by out-of-field teachers than students in high-track, higher-grade level or predominantly white classes?

BEST COPY AVAILABLE

Introduction

Do all secondary students in the U.S. have equal access to qualified teachers? Are students in low-income schools more likely to be taught by teachers without basic qualifications, in their assigned teaching fields, than those in more affluent schools? Do schools serving predominantly minority student populations tend to have less qualified faculties? Moreover, are there differences in access to qualified teachers across different types of students and different types of classrooms within schools?

Over the past several decades, equality has been one the most fundamental concerns of education policy and research in the U.S. The focus of a vast amount of research and reform in education has been to uncover and address disparities in the resources and opportunities in education provided to students from different socio-economic backgrounds (e.g. Coleman et al. 1966). Among the most important of these educational resources is the teaching force. The largest single component of the cost of education in any country is teacher compensation. Moreover, teachers are, of course, a highly important part of the actual educational process, and students' educational outcomes ultimately depend on the work of teachers. Indeed, it is precisely because the teaching force is a significant resource that equal access to qualified teachers and quality teaching has been a source of contention in the national debate over equality of educational opportunity.

Among those concerned with issues of educational equality, it is widely believed that students from disadvantaged backgrounds do not have equal access to qualified teachers. A number of critics have argued that, indeed, the most needy students in the U.S. -- those from poor, minority, and disadvantaged communities -- are taught by the least qualified teachers (e.g., Darling-Hammond 1987; Kozol 1991; Oakes 1990). These critics argue that low-income and high-minority schools are unable to offer competitive salaries, benefits or resources and, hence, simply cannot compete for the available supply of trained teachers. In this view, unequal access to qualified teachers and, hence, to quality teaching, is one of the key reasons for unequal results in student educational outcomes.

These critics argue, moreover, that patterns of unequal access to quality teachers also appear within schools. Not only do students in low-income and predominantly minority schools have less access to qualified staff, but, the critics add, low-income and minority students, when in affluent schools, also have less access to the best teachers. The latter is due to the practice of separating students and teachers by purported ability -- the system of tracking. In this view, minority and poor students are disproportionately placed in lower track and lower achievement courses, which these critics further claim, are taught by the least qualified teachers.

Despite the importance of this debate on educational equality and the widespread belief that schools, programs, and classes serving low-income and minority student populations have less access to quality teaching, there has actually not been much empirical research done on this issue, especially at the national level. One of the reasons for this dearth of research is the difficulty involved in obtaining data on the underlying issue of importance - the degree of actual exposure to quality teachers and quality teaching provided to students in classrooms. Assessing the caliber of teachers' classroom performance and the degree to which students have access to quality teaching in classrooms is a difficult empirical task because there is little consensus concerning both how to define and how to best measure quality teachers and teaching (e.g., Haney et al. 1987; Ingersoll 1996a). As a result, researchers typically turn to what is more easily assessed and more readily available - measures of teacher qualifications.

Although the qualifications of teachers - such as their education, training, and preparation - are only indirect measures of the quality of teaching that students receive, they provide useful information on this important educational resource.

Education and training are essential ingredients of quality teachers and quality teaching. There is almost universal agreement that one of the most important characteristics of a quality teacher is preparation in the subject or field in which the teacher is teaching. Research has shown moderate but consistent support for the reasonable proposition that subject knowledge (knowing what to teach) and teaching skills (knowing how to teach) are important predictors of both teaching quality and student learning (for reviews of this research see: Shavelson et al. 1989; Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). Knowledge of subject matter and of pedagogical methods do not, of course, guarantee quality teachers nor quality teaching, but they are necessary prerequisites.

The argument for the necessity of education in subject knowledge is especially clear for the secondary school level. First, at the secondary level, teachers are divided by fields into departments; faculties are thus more specialized than in elementary schools, and therefore the differences between fields are more distinct and, perhaps, greater. Moreover, the level of mastery needed to teach different subjects is higher at the secondary school level, and therefore a clear case can be made that such teachers ought to have adequate substantive background in the subjects they teach.

BEST COPY AVAILABLE

In order to address fully the issue of access to qualified teachers, however, it is necessary to distinguish between teacher training and teaching assignment. These represent two distinct elements. Teacher training refers to the quantity and quality of teacher education and preparation. Assessments of training levels typically examine whether teachers have a basic college education, licensing and expertise in a specialty field. On the other hand, assessments of teacher qualifications also need to examine whether the fields of training and preparation of teachers match their teaching assignments. That is, such assessments need to assess the extent of out-of-field teaching - the phenomenon of trained teachers teaching subjects for which they have little training. It is important to distinguish between these two elements in assessments of teachers' qualifications because they have very different implications for policy. If underqualified teaching is due to inadequacies in the quantity or quality of teacher education and preparation, it is probable the source of the problem may lie with teacher education programs and standards. On the other hand, if underqualified teaching is due to high levels of mismatch between teachers' fields of training and their teaching assignments, then it is probable the source of the problem may lie with the supply of teachers or the management of schools.

The problem for research on teacher qualifications has been that there have not been the necessary data, especially at the national level, to adequately assess the extent to which teachers are assigned to teach out of their fields. Moreover, there has been little data on the numbers of students actually taught by out-of-field teachers -- information crucial to understanding disparities in student access to qualified teaching.

In order to address these and other data needs concerned with the staffing, occupational and organization aspects of schools, in the late 1980s the National Center for Education Statistics (NCES) designed and conducted the Schools and Staffing Survey (SASS), a major new survey of teachers and schools. NCES has since sponsored several projects designed to define and assess both the qualifications of the nation's teaching force and the extent of out-of-field teaching in the U.S. (McMillen and Bobbitt 1993; Bobbitt and McMillen 1995; Ingersoll 1995a, 1996b). These previous analyses have shown that, in fact, out-of-field teaching is extensive in U.S. schools. Moreover, these analyses have documented that this underqualified teaching was not due to a lack of basic education or training on the part of teachers. The source of out-of-field teaching lay in the lack of fit between teachers' fields of training and their teaching assignments. Most teachers have training, such as a college major, in their main field of assignment. But, many teachers, especially at the secondary level, are also assigned to teach additional courses in fields for which they have little or no formal background preparation.

This article expands on this earlier work by analyzing national data from the 1990-91 SASS to examine the issue of disparities in student access to qualified teachers. Rather than enter the debate as to what constitutes a qualified teacher, quality teaching or quality teacher training, this analysis adopts a minimal definition of adequate qualifications. The premise underlying this analysis is that adequately qualified staffing requires teachers, especially at the secondary school level and especially in the core academic fields, to hold, as a minimum prerequisite, at least a college minor in the fields taught. The analysis focuses on how many secondary level students enrolled in the core academic subjects (mathematics, English, social studies, science) are taught by teachers without at least a college minor in the field. In this view, even a moderate number of teachers lacking such minimal training prerequisites is a strong indication of inadequacies in the staffing of schools.

The analysis examines whether access to qualified teachers is equally distributed across different student populations. It begins by focusing on differences between high-poverty and low-poverty schools, and also between high-minority and low-minority schools. Many researchers assume that the high-poverty and minority populations are one and the same. It is important, however, to examine the data on out-of-field teaching by these two characteristics separately, because previous research has suggested that differences in the levels of teacher qualifications are not always the same across them (Pascal 1987).

The analysis also examines within-school differences in teacher qualifications across classes of different student ability groupings, and of different student races and ethnicities. Again, it is also important to examine out-of-field teaching separately by these sets of characteristics because it cannot be assumed that their relationships to teacher qualifications are the same.

Finally, this analysis examines within-school differences in teacher qualifications across different secondary school grade levels - specifically, grades 7 through 12. Although many may agree that basic education is an essential prerequisite of qualified teachers, there is probably less agreement whether out-of-field teaching has as serious consequences at the junior high level as it has for the senior high grades. Hence, it is important to distinguish among grades at the secondary level and to determine whether there are, in fact, differences in out-of-field teaching levels across these different grade levels.

Data and Methods

BEST COPY AVAILABLE

The data source for this study is the nationally representative 1990-91 Schools and Staffing Survey. The U.S. Census Bureau collected these data for NCES in early 1991 from a random sample stratified by state, sector and school level. SASS is particularly useful for addressing questions concerned with teachers' qualifications. It is the largest and most comprehensive dataset available on teachers and school staffing characteristics in the U.S. Indeed, as indicated earlier, this survey was conducted for the reason that there has been a paucity of nationally representative data on such issues. SASS, for example, includes a wide range of information on the training, education, qualifications and teaching assignments of teachers that can be disaggregated by field and also disaggregated by the characteristics of schools, students and classrooms (For more information on SASS, see Choy et al. 1993).

The sample utilized in the analysis consists of 25,427 public school teachers, including those employed both full-time and part-time. This analysis focuses solely on those teaching at the secondary-school level (grades 7 through 12), regardless of whether the school was actually a middle school, junior high school, a senior high school, a secondary school, or a combined school. Furthermore, it solely focuses on those who taught departmentalized courses in any of the core academic fields (English, mathematics, science, social studies). For example, secondary level teachers teaching multiple subjects in self-contained classes were excluded from the analysis. Likewise, the non-7-12th grade portions of the schedules of teachers in combined schools or middle schools were excluded.

For each class period in the school day of each of the sampled teachers, data were collected on the subject taught, grade level, class type or track, student achievement level, student race/ethnicity and the number of students enrolled. In addition, teachers reported their certification status and the major and minor fields of study for each of their degrees earned, at both the undergraduate and graduate levels. We have used these data in a series of projects to develop and compare a range of different measures of out-of-field teaching (see McMillen and Bobbitt 1993; Bobbitt and McMillen 1995; Ingersoll 1995a, 1996b). This analysis focuses on one measure drawn from this earlier research: *the percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field.*

Fields are defined broadly in this analysis. The core academic subjects and college major/minors are broadly categorized into four fields parallel to conventional core academic departments in secondary schools: mathematics, science, social studies, and English. To be defined as in-field, English teachers must hold at least a minor in either English, English education, language arts, literature, reading, communication or journalism. Mathematics teachers must hold at least a minor in either mathematics, engineering, or mathematics education. Science teachers must hold a minor in any of the sciences. Social studies teachers (i.e., history, economics, civics, world civilization) must hold at least a minor in one of the social sciences, in history, or in social studies education.

The objective of this analysis is to examine differences in the levels of out-of-field teaching among different types of schools, based on the poverty level and race/ethnicity of the students enrolled and across different kinds of classrooms within schools. These measures are:

Poverty enrollment of school - percentage students in each school receiving federal reduced or free lunch program.
Low-poverty: less than 15%
Medium-poverty: 15% to 50%
High-poverty: 50% or more
Minority enrollment of classroom or school - percentage non-white students.
Low-minority: less than 15%
Medium-minority: 15% to 50%
High-minority: 50% or more
Type or track of class -
Low-track: general, remedial, vocational, special education Medium-track: academic/college preparatory
High-track: honors, advanced placement, gifted.
Grade level of class - grades 7 through 12

Results

What proportion of the nation's public secondary students are taught core academic subjects by out-of-field teachers?

Overall, substantial proportions of students in public secondary schools in the U.S. were taught academic subjects by teachers without basic qualifications in those subjects. The proportions of public secondary school students taught each of the core academic fields by teachers without at least a minor in the field are presented in table 1. For example, about one fifth of all public school students enrolled in English classes in grades 7-12, or about 4,310,000 of 20,700,000 students, were taught by teachers who did not have at least a minor in English, literature, communications, speech, journalism, English education or reading education. In addition, over one quarter of all public school students enrolled in mathematics classes in grades 7-12, or about 4,124,000 of 15,510,000 students, were taught by teachers without at least a minor in mathematics or in mathematics education. In science, 17 percent of all public school students enrolled in science classes in grades 7-12 were taught by teachers without at least a minor in any of the sciences or in science education. Overall, a relatively low

BEST COPY AVAILABLE

proportion of students were taught social studies out of field; thirteen percent of students enrolled in social studies were taught by teachers without at least a minor in any of the social sciences, in public affairs, in social studies education, or in history.

Table 1 - Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected school characteristics

	English	Math	Science	Social Studies
Total	**20.8**	**26.6**	**16.5**	**13.4**
Minority Enrollment of School:				
Low-minority	20.0	24.3	13.9	11.6
Medium-minority	19.1	23.1	16.6	15.6
High-minority	24.4	33.6	17.8	14.4
Poverty Enrollment of School:				
Low-poverty	15.6	20.6	11.9	11.6
Medium-poverty	21.7	30.1	16.0	14.5
High-poverty	33.2	32.6	29.3	15.3

Are students in schools serving predominantly poverty-level or minority student populations more likely to be taught by out-of-field teachers than students in schools serving predominantly not poor or white students?

There were also differences in the amount of out-of-field teaching across different types of schools, but this depended on the type of schools compared and the fields examined. Notably, although in some fields there appear to have been slight differences in levels of out-of-field teaching between high and low-minority schools, in no fields were these differences statistically significant.

In contrast, school poverty levels were clearly related to the amount of out-of-field teaching and the differences were in the direction predicted by the literature on educational inequality. That is, in no fields did high-poverty schools have less out-of-field teaching than did low-poverty schools, while in several fields, students in high-poverty schools received distinctly more out-of-field teaching then in low-poverty schools. For example, a third of English students in high-poverty schools, as opposed to 16 percent in low-poverty schools, were taught by teachers who did not have at least a minor in English, English education, language arts, literature, reading, communication or journalism. There was, however, little difference in out-of-field teaching in social studies between schools of different poverty levels. Regardless of the school poverty level, all had relatively low levels of out-of-field teaching in social studies.

Are students in low-track, or lower-grade level classes, or classes predominantly comprised of minority students, more likely to be taught by out-of-field teachers than students in high-track, higher-grade level or predominantly white classes?

The amount of out-of-field teaching was not equally distributed across different types of classes and groups in schools. These data are displayed in table 2.

Table 2 - Percentage of public secondary school students enrolled in classes taught by teachers without at least a minor in the field, by field and selected classroom characteristics

	English	Math	Science	Social Studies
Total	**20.8**	**26.6**	**16.5**	**13.4**
Type or Track of Class:				
Low-track	24.7	33.5	20.4	14.3
Medium-track	11.8	15.7	9.2	8.9
High-track	11.2	20.4	7.2	11.2
Minority Enrollment of Class:				
Low-minority	19.2	22.7	14.6	12.3
Medium-minority	19.9	24.2	17.7	15.0
High-minority	25.2	36.1	19.6	14.3
Grade Level of Class:				
7th grade	32.2	48.8	31.8	23.9
8th grade	32.9	37.1	23.8	19.7
9th grade	15.7	18.1	10.7	8.7
10th grade	11.1	16.8	8.9	8.8
11th grade	11.2	15.9	6.4	6.8
12th grade	13.9	24.2	13.1	11.3

BEST COPY AVAILABLE

In several fields, students in high-track classes had less out-of-field teaching than did those in the low-track classes. For instance, about one tenth of students in high-track English classes were taught by out-of-field teachers. But, about one quarter of those in low-track English classes received out-of-field teaching. There was, however, little difference in levels of out-of-field teaching between the two higher tracks - the honors/gifted/AP track and the college preparatory track.

In contrast to tracks, there was little difference in out-of-field teaching between predominantly white and predominantly minority classes. In none of the fields was there a statistically significant difference in out-of-field teaching between high-minority classes and low-minority classes.

There were, however, some distinct differences between the junior high school grade levels and the senior high school grade levels. Students in grade 7 were more likely to have received out-of-field teaching than were 12th grade students in all fields, with the exception of math. For example, about one third of science students in 7th grade were taught by teachers without at least a minor in any of the sciences or science education; while this was true for only about a tenth of the science students in 12th grade. In some fields, students in grade 8 were also more likely to have received out-of-field teaching than were 12th grade students. There were not, however, distinct differences among the senior high grade levels. Ninth grade students, for example, were not necessarily more likely to have been taught by an out-of-field teacher than were 12th grade students.

Discussion

The data clearly show that many students in public schools in grades 7-12, regardless of the type of school, were taught core academic subjects by teachers without at least a college minor in the field taught. They also show that there were some distinct inequities in the distribution of out-of-field teaching across schools and classrooms. This article does not, however, address the question of what are the reasons, causes or sources of out-of-field teaching, nor why some schools or classrooms have more of it than others. Other analyses using SASS data to examine out-of-field teaching offer some insights and I will review these below.

Many have argued that out-of-field teaching is a problem of poorly trained teachers. As indicated earlier, this view is incorrect. Out-of-field teaching is not due to a lack of education on the part of teachers but is due to a lack of match between teachers' fields of training and their fields of assignment.

Other educational analysts have argued that out-of-field teaching is due to teacher shortages. There is some truth to this view. Some schools do report having difficulties finding qualified candidates for teaching job openings and school administrators commonly turn to the use of substitute teachers, in-school reassignments and hiring of the underqualified as coping strategies. Out-of-field teaching is the inevitable result of these kinds of coping strategies.

But, contrary to conventional wisdom, neither out-of-field assignments nor teacher shortages are primarily due to increases in either student enrollments or teacher retirements.

The demand for new teachers is primarily from teacher turnover, not increases in student enrollments. Moreover, poor working conditions, not teacher retirements, create most turnover. Hence, shortages result most often from poor working conditions. Low teacher salaries, little faculty input into school policies, and rampant student discipline problems all contribute to teacher turnover. Improving these things would decrease turnover, which would quickly eliminate shortages. It would also remove much of the need for out-of-field assignments in the first place.

This points to an alternative explanation of out-of field teaching -- the low status of the occupation. Unlike in many of the other developed nations, teachers in the U.S. are largely treated as low and semi-skilled workers. The data suggest that out-of-field teaching is not an emergency condition, but a normal and ongoing practice in many schools. This prevalence attests to how widely accepted is the idea that teaching does not require any special expertise and that teachers are like interchangeable blocks that can be placed in any empty slot regardless of their type of training. Clearly, if teaching was treated as a highly valued profession and provided with commensurate rewards, respect and working conditions, there would be no problem attracting and retaining more than enough qualified teachers, and out-of-field teaching would neither be needed nor permitted.

Related to the question of the causes of out-of-field teaching, is a second question - why do some schools have more of it than others? In particular, why do low-income schools have higher levels of out-of-field teaching?

As mentioned earlier, one view, widely held among critics of educational inequality, is that low-income schools are not able to attract, or to retain, adequately trained teachers because they are unable to match the salaries, benefits and resources offered by more affluent schools. As a result, these critics hold, such schools have difficulties hiring adequately trained teacher candidates and suffer from high levels of teacher turnover (e.g., Kozol 1990; Oakes 1990).

There has, however, been little empirical verification of this view and, moreover, data from SASS suggest that

BEST COPY AVAILABLE

this explanation may not be entirely correct. The data show, for example, that starting-level and advanced-level salaries in high-poverty schools are not appreciably lower than in other schools. In addition, teacher turnover rates are also not appreciably higher in low-income schools (Ingersoll 1995a). Low-income schools do appear to have slightly more difficulty in filling teaching openings. But, these differences appear to account for some, but not all, of the high levels of misqualified teachers in such schools. SASS data show, for example, that there are several factors besides the overall poverty or affluence of the student population that are related to the degree of out-of-field teaching in schools. For instance, school size and sector are both strongly related to out-of-field levels; small schools and private schools both have distinctly higher proportions of out-of-field teaching (Ingersoll 1995a, 1996c). These issues warrant further research.

An additional important issue concerns equalities in access to qualified teachers, according to the race/ethnicity of students. As noted above, it is commonly believed among education analysts that both poor and minority students do not have equal access to qualified teachers (e.g., Kozol 1990; Oakes 1990). In contrast, this analysis finds few distinct differences in levels of out-of-field teaching, according to the proportion of minority students in classrooms or in schools. This does not mean, of course, that there are no inequalities in access to quality teaching and quality teachers, according to the race/ethnicity of students. There may be other kinds of differences in access that are not revealed by the data and measures used in this analysis. Moreover, this analysis does not separately examine different minority groups and, hence, there may be differences in access between different minority groups not revealed here. What this analysis simply shows is that minority students, as a whole, were not more likely to have been taught by out-of-field teachers. Moreover, it also corroborates the importance of distinguishing between race/ethnicity and income/poverty characteristics of student populations.

References

Bobbitt, S. & McMillen, M. (1995). *Qualifications of the public school teacher workforce: 1988-1991.* (NCES Report No. 95-665). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Choy, S., Henke, R., Alt, M., Medrich, E., & Bobbitt, S. (1993). *Schools and staffing in the US: A statistical profile, 1990-91.* (NCES Report No. 93-146). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Coleman, J., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfeld, F., & York, R. 1966. *Equality of Educational Opportunity.* Washington, D.C.: U.S. Government Printing Office.

Darling-Hammond, L. (1987). "Teacher Quality and Equality." In P. Keating and J.I. Goodlad, *Access to Knowledge.* New York: College Entrance Examination Board.

Darling-Hammond, L. and Hudson, L. (1990). "Pre-college Science and Mathematics Teachers: Supply, Demand and Quality. *Review of Research in Education.* Washington, D.C.: American Educational Research Association.

Haggstrom, G. W., Darling-Hammond, L., & Grissmer, D. (1988). *Assessing teacher supply and demand.* Santa Monica CA: Rand Corporation.

Haney, W., Madus, G., & Kreitzer, A. (1987). Charms talismanic: Testing teachers for the improvement of American education. *Review of Research in Education,* 13: 169-238. Washington, DC: American Educational Research Association.

Ingersoll, R. (1995a). *Teacher Supply, Teacher Quality and Teacher Turnover: 1990-91.* (NCES Report No. 95-744). Washington, DC: National Center for Education Statistics.

Ingersoll, R. (1995b) "Teacher Supply and Demand in the U.S." In *The Proceedings of the American Statistical Association: 1995.* Alexandria, Va: American Statistical Association.

Ingersoll, R. (1996a). *National Assessments of Teacher Quality.* Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Ingersoll, R. (1996b). *Out-of-Field Teaching and Educational Equality.* (NCES Report No. 96-040). Washington, DC: National Center for Education Statistics.

Ingersoll, R. (1996c). *The Problem of Out-of-field Teaching in the U.S.* Paper presented at the annual meeting of the American Sociological Association.

Kozol, J. (1991). *Savage Inequalities.* New York: Harper-Collins.

McMillen, M. & Bobbitt, S. (1993). *Teacher certification, training and work assignments in public schools.* Paper presented at the annual meeting of the American Education Research Association.

Murnane, R. and Raizen, S. (1988). eds. *Improving indicators of the quality of science and mathematics education in grades k-12.* Washington, D.C.: National Academy Press.

Oakes, J. (1990). *Multiplying inequalities: The effects of race, social class, and tracking on opportunities to learn mathematics and science.* Santa Monica, CA: The RAND Corporation.

Pascal, A. (1987). *The qualifications of teachers in American high schools.* Santa Monica, CA: The RAND Corporation.

Shavelson, R., McDonnell, L. and Oakes, J. (1989). *Indicators for monitoring mathematics and science*

BEST COPY AVAILABLE

education. Santa Monica, CA: Rand Corporation.